THE

BOSTON MEDICAL AND SURGICAL JOURNAL.

VOL. LXV. THURSDAY, AUGUST 8, 1861. No. 1.

DR. WARE'S LECTURES ON GENERAL THERAPEUTICS.

LECTURE VII.

GENTLEMEN,—From what was stated in the last lecture, you will infer the great importance to be attributed to the large intestines as an object of attention in the treatment of disease, and this, whether the view taken of their functions be correct or not. It is of the more consequence to recognize this fact, because their condition is capable of being more directly observed, and more directly modified than many others whose influence upon life is more distinct and powerful. Affections of the brain, the heart and the lungs, for example, are more dangerous than those of the colon, but then we cannot so well understand what those affections are, nor how they are to be reached by remedies.

The condition of the large intestines in disease is, therefore, particularly worthy of study. They are not only frequently the seat of actual disease themselves, but they are constantly liable to disturbance in diseases of other parts—partly from their intimate sympathies, but partly also from the fact, that, as the alimentary canal is the inlet of so much foreign matter into the system, especially as in disease it is the common receptacle of food and medicine, it is constantly liable to be disordered from the want of harmony between the articles introduced and the state of the organs receiving them.

The symptoms that depend upon the state of the colon—to speak of this for convenience sake as the representative of the whole tract—do not always exhibit themselves in the organ itself, or, if they do, they are also accompanied by symptoms in other parts, and these are often so considerable that they may be supposed to indicate actual affections of those parts. Of this nature are many headaches, both habitual and occasional, some of them of the most severe character—vertigoes, palpitations, dyspnœa, fainting, hysterical and other affections of the mind. The class of symptoms called nervous, and distinct neuralgia, wherever situated, if not proceeding primarily from the condition of the colon, are yet greatly

influenced by it, and capable of being much alleviated by a proper regulation of its functions. Multitudes of those sensations which are the source of so much discomfort to the sick, are traceable to this organ as their source;—such as general uneasiness and restlessness, want of sleep; disturbed, unquiet and unrefreshing sleep; wandering pains and nervous feelings in various parts, especially in the legs; cramps, &c.

The effects produced, or supposed to be produced, by wind or gas in the canal, especially in the colon, illustrate extremely well the way in which these symptoms present themselves. This cause of derangement is apt to be looked upon as a rather trivial matter and hardly worthy of serious notice; yet this is by no means a right view of it. If we measure the importance of a cause by the suffering and annoyance it occasions, this constitutes in many persons by its intensity and persistency a formidable evil. The trouble from wind may arise partly from its quantity, and partly from the state of the organ, when the quantity itself is not abnormal. This is equally true of other parts of the canal. When the mucous and more especially the muscular coat is tender, irritable or inflamed, that amount of flatus which is present in the most healthy organ becomes a source of annoyance. The management of gaseous contents by a hollow muscular organ requires a more exact. and a more difficult effort than for either solid or liquid. This is so much the case that the carrying onward of flatus and its discharge from the rectum by a perfectly healthy intestine is often attended by a sharp pain, where the nature of the food has occasioned a small increase of its quantity. This is much more the case when the muscular power is weak or the intestine irritated or inflamed. In such case, indeed, the ordinary and necessary peristaltic motion is attended by pain, oppression, tenderness and sympathetic sensations. As a consequence of this, patients often imagine that the generation and presence of wind is the real difficulty under which they labor, because all its motions produce so much pain and its evacuation so much relief. The true fact, however, is, not that its quantity is greater than ordinary, but that the state of the organs is such, that the ordinary quantity cannot be handled by them without distress. In such a case relief is not to be sought by promoting the discharge of flatus when it will be only temporary, but by removing or soothing the condition of the intestine. Thus an aromatic, an opiate, or an external application will succeed, when a cathartic fails. But it is not so when there is actually such an increase in the quantity of wind as to distend unnaturally any part of the canal. In this state of tension of the muscular and nervous textures, the movements of the flatus are accompanied by acute intermittent pain—whilst its quiescent condition is attended not only by local uneasiness, but by sundry nervous symptoms agitating both body and mind—by headaches, dizziness, faintness, cramps and pains in various parts, and these can only be relieved by its evacuation.

In judging of symptoms proceeding from the state of the colon, whatever may be their cause, the mechanical relations of this organ are to be kept constantly in view. I refer particularly to the manner in which it is distributed over the abdomen. The small intestines, it is to be recollected, are collected together in mass in the central parts of this cavity, and sensations from them are referred with great uniformity to this region. With the large intestine it is different. This surrounds the small, and visits successively nearly every part of the cavity, coming into contact or into near proximity with all the important organs it contains. Hence sensations in the colon are often confounded with sensations in other parts, and *vice versa;* actual disease in the colon is confounded with disease in its neighborhood, and, still further, a disordered condition of the colon actually disorders the neighboring parts themselves. Examples of this nature are of constant occurrence. Flatus will accumulate and distend the several parts of the organ, producing various symptoms according to the part in which it accumulates. By impeding the descent of the diaphragm, it causes dyspnœa. By pushing it up into the left side of the chest, it interferes with the free movements of the heart, producing palpitation and irregular action. In both hypochondria and across the back, across the hypogastric region, and also in the region of the womb and bladder, the same cause will produce analogous sensations. Various other affections of the colon illustrate the same fact. Acute inflammation is not unfrequently taken for pleurisy—and chronic for inflammation of the liver. The stomach and colon, from their close proximity, mutually affect each other, and so do the colon, womb and bladder. In diarrhœa it often happens that the sudden introduction of warm liquid into the stomach produces immediately a loose discharge by its transmitted impression on the colon, but giving rise to the erroneous idea that the liquid swallowed has passed rapidly through the whole tract of the canal. From a similar transmitted impression, strangury is not an unusual accompaniment of dysentery, and diarrhœa of the advent of the catamenia. Various pains, sometimes fixed, and sometimes rambling in the most promiscuous manner from one part of the trunk to another, can only be explained by attributing them to the several portions of the colon, not diseased, indeed, but weak, tender or irritable; such pains are felt in either hypochondrium, in the epigastrium, at the angle of either scapula, across the small of the back often attributed to the kidneys, in the iliac regions and in the hips. Similar pains exist, no doubt, in other organs when in a corresponding condition, as in the eye, the throat, the stomach, the bladder and the womb, but the erratic character of those to which I refer is due to the mechanical arrangement of the large intestine, and affords one diagnostic mark of their seat.

These considerations explain why it happens that the state of

the colon is capable of such a varied influence in disease—an influence often so transient; why, for instance, even under very considerable disturbance and suffering, such marked and sudden relief is experienced from slight causes, as from a small discharge of fæces or wind—why symptoms vary so much without any corresponding variation in the state of the original disease which can be detected. A little reflection will show us to what a variety of influences this organ is subjected, which without producing serious injury are yet capable of varying the sensations of a part so highly sensitive and the seat of such an extended sympathy; thus partially or imperfectly digested portions of food may be poured into it from the small intestines, and as the elaboration of healthy fæces is as truly vital a function as the digestion of food, and healthy fæces are the only substance which can properly be said to stand in a perfectly normal relation to the mucous lining, anything else may produce irritation. If anything disturbs its function, as a fault in the liver, a fault in its own secretions, the presence of anything which undergoes common chemical changes, such as acidity, putrefaction, the extrication of gas, the patient may be much disturbed and yet the disturbance be very transient and easily removed. The colon is probably sometimes irritated by its own secretions, or rather by that imperfect state of its secretions which proceeds from the combined state of the organ itself, of the liver, and of the ingesta. One or all may be wrong, and yet the excitement of a healthy secretion of bile and its admission into the colon may induce in it a healthy action, and enable it to go through with its natural office of fæcalization.

This statement, though only a partial and imperfect one, serves to illustrate the complicated character of the relations which the colon bears to the body in disease, and consequently of the study of purgatives as remedies; for the study of purgatives is necessarily connected with all the points which have been adverted to. Purgatives, it is true, operate more or less upon the whole canal, but it is their connection with the large intestines mainly with which we are conversant, because it is this connection which we can best observe and understand.

The most obvious and simple idea of a cathartic is that it is an agent which empties the canal of its contents. Yet this is a very incomplete one. The evacuation of the canal is only one of the effects it produces. Probably it is not always, though it may be generally, the most important one, but it is the only one the precise measure of which can be perfectly understood. Whatever other effects are produced, we must remain in considerable uncertainty as to their nature and amount. We must consider cathartics, therefore, only in a general way, as subjects of inference and conjecture rather than of absolute knowledge. Cathartics, we have reason to believe, differ as to the part of the canal upon which they act, and the texture of the part, mucous, glandular or muscu-

lar; as to the character of the secretions they educe; as to the influence their operation upon the canal is capable of exerting upon other parts, as the blood and fluids, and upon the system at large; and as to the way in which the same article may affect different diseases and different constitutions. Here at once we perceive how many elements--as happens with regard to every question in therapeutics—enter into the analysis and complicate the judgment.

Cathartics have effects of several distinct kinds, and these effects will take place irrespective of any beneficial influence over disease. This influence is a separate question. The effects referred to are absolute and are physiological in their character. They may also prove remedial, but not necessarily so, for they may, on the other hand, be injurious. This distinction, already more than once referred to, cannot be kept too constantly in view, for it is apt to be overlooked. We are too ready, if a medicine produces the absolute operation we expect, to infer that it has been rightly used; this, at least, is almost uniformly the popular inference. Yet it is often a very erroneous one. Thus it is very certain that hydragogue cathartics, such as gamboge and elaterium, will produce copious watery discharges from the bowels, and thus often carry away dropsical accumulations; but it by no means necessarily follows, though it undoubtedly sometimes does, that the removal of the accumulation will cure the disease. It is quite possible, on the contrary, that the ultimate influence upon the patient will be disastrous rather than beneficial. It is so in a great many other cases.

The first effect of a cathartic is simply to empty the bowels of what they contain by increasing their muscular action. The second is to increase the natural secretions of the parts upon which they act. The third is to induce some change in the vital condition of the parts, one of the consequences of which is the production of altered secretions. These effects are combined together, and are exhibited in the character of the discharges. The fourth, as a consequence of the preceding, is to produce changes in parts more or less remote and upon the state of the fluids—as upon the brain, the liver, the kidneys, the blood, &c. Now no individual cathartic produces these effects in an insulated manner. No one is an evacuant only; or acts only to increase or alter the secretions. There is no one in whose operations all these offices are not combined in different proportions—in some one predominating, and in some another. But although there is no one cathartic in which all these powers do not probably exist in some degree, there is a vast difference in the relative proportion in which they are exhibited by different articles, and a marked difference in the degree in which they operate on different parts of the canal. As illustrating these different capabilities, we infer that calomel acts chiefly upon the stomach and duodenum, and through them secondarily upon the liver, but hardly any lower down, except so far as the secretions it has pro-

duced excite the intestines below in order to bring about their own evacuation. So much is this the case, that a dose of calomel will often fail to operate unless followed up by some other cathartic. The operation of rhubarb is less distinctly localized, but appears also to act much on the upper part of the canal, whilst senna acts little on the stomach, except from its bulk and nauseous qualities, but much upon the small intestines and moderately upon the large. Aloes and the other resinous catharties seem more especially related to the large intestines through their whole course, but aloes, particularly, to their lower part. Salts act apparently upon the whole tract of the canal, but in a very superficial way, and to the production of copious watery secretions. Jalap, gamboge and elaterium produce also copious secretions, but they act more deeply, and the secretions are less watery. In contrast with these, castor and croton oils and aloes are particularly distinguished as evacuants, though still having considerable power as producers of secretions. In all these points of view we find infinite varieties in different subjects and in different diseases.

In the first point of view, as evacuants, cathartics are of extensive application in treatment, and within due limits they are of great advantage. They are, indeed, in most cases, indispensable at some period of their course. This needs no extended illustration. A constant onward movement of the contents of the alimentary canal is a law of its function in health, and is, so far as we know, equally so in disease. The peristaltic motion of the intestines probably never intermits, even when the evacuation of fæces is suspended, but is a condition as necessary to their function as the constant distension and collapse of the brain, the rhythmic contractions of the heart, and the alternate dilatation of the lungs, and ultimately, though less immediately, as necessary to life. Whether food be taken or not, whether digestion be going on or not, it seems to be equally indispensable that the contents of the canal, whatever they are, should undergo this onward movement, or at least that the organs themselves should keep up that contraction which governs it.

But though never ceasing altogether, this movement probably is often much diminished in intensity, vigor and effectiveness, and is not only necessary for the propulsion of the contents of the bowels, but to the healthy relations and sensations of all the organs within the abdomen. Many of the disagreeable feelings experienced by costive persons may be owing to the diminution and perhaps temporary suspension, in some part, of this exercise of the muscular tunic, such as a sinking sensation, a sensation of numbness and weakness, of inaction, torpidity, deadness, &c. When such sensations are present, the occurrence of absolute pain is often hailed by the patient as an agreeable change. They are also strikingly relieved, sometimes, by a very small discharge of fæces, secretions or flatus; the relief arising not from getting

rid of the matters evacuated, which seem innocent enough, but from the increased muscular motion indicated, just as the brisk voluntary muscular movement of a long inactive limb is so grateful to the subject, and relieves at once those indescribable nervous sensations which are so commonly experienced.

The second effect is the increase of the ordinary secretions. Some cathartics, particularly the various salts, produce very copious discharges of this kind. As these discharges are directly drawn from the blood, it has been supposed that the bulk of this fluid may in this way be almost as rapidly diminished as by bloodletting, and that therefore purging may be efficaciously employed as a substitute for this remedy. Doubtless the bloodvessels may be unloaded to as great an extent, though somewhat less rapidly, by purging as by bleeding, but it is done in a different way and with a different result. Purging is not an evacuation of the whole elements of the blood, but of only a portion of them. Now although some of the immediate effects of bleeding may be connected with diminished bulk, yet the permanent and remote ones, as we shall have occasion to see hereafter, depend upon a different cause, and these are at least quite as important. The loss produced by purging is speedily restored, and that without any sensible change in the character of the blood; that produced by bleeding, although it may be rapidly restored as to quantity, is repaired as to quality more slowly and by a greater vital effort.

As to the third effect of cathartics, viz., the production of secretions other than the normal ones, no one can reasonably doubt of its reality who is in the habit of carefully inspecting, with this consideration in view, the discharges produced by different cathartics, as calomel and colchicum, for example. Their products are not only unlike each other, but unlike those produced by any other articles, or by any form of disease. In a less marked degree it is not unlikely that the product of each distinct cathartic has something peculiar to itself, and something also dependent upon the state of the intestine and the state of the blood. It is not uncommon in disease to find discharges which are entirely distinct in color, odor and consistence from the natural. In the odor, for instance, we note the acid, the urinous, the cheesy, the fœtid, the putrid; and the influence that cathartics are capable of having over the secretory action is shown by the change sometimes produced by their exhibition. Thus, in the bowel complaint of children, where the discharges are entirely altered from their natural condition, a single dose of castor oil will sometimes bring back the natural color and smell, and apparently give an entirely new character to all those secretions which enter into the composition of the stools, especially of the liver and colon.

The last effect of cathartics is to alter the condition of remote parts and the state of the blood. This is closely connected with the preceding. Remote parts may be affected through their sym-

pathy with the state of the colon, or by some modification of its assimilating function which influences the nutritive relations of the blood. The blood may be also more directly modified by changes induced in the excretory office of the colon, and by the secretions educed from it by the operation of cathartics. According to the quality and the ingredients separated from the blood, will necessarily be the character of the blood left after that separation.

It is probable, as already suggested, that the different cathartics have each their peculiar powers in these several respects, and that no two are precisely alike. Still, it is also probable that for many of the purposes of practice the difference is not very important, and they may be employed without attempting a very nice discrimination, in ordinary cases.

[To be continued.]

RESEARCHES OF PASTEUR RESPECTING THE THEORY OF SPONTANEOUS GENERATION.

[Translated and condensed for the AMER. JOURNAL OF SCIENCE AND ARTS, by M. C. WHITE, M.D.]

THE theory of spontaneous generation was long since proposed to account for the origin of beings whose germs were too minute or too obscure to attract attention. One after another the different organisms supposed to arise from spontaneous generation have been proved to originate from germs. At present the question of spontaneous generation concerns only the origin of *entozoa* and those minute organisms which can be studied only with the aid of the microscope, as moulds (minute fungi), and infusoria both animal and vegetable. The common theory that the spores or germs of these minute organisms are constantly floating in the atmosphere, ready to start into activity whenever they meet with a suitable nidus, has found an able advocate in M. Pasteur of the Normal School of Paris, who has published in the *Comptes Rendus*,* a series of valuable papers on this subject, the substance of which I have translated for this Journal.

In order to collect and examine the solid particles floating in the atmosphere, Pasteur placed soluble gun cotton in a glass tube, and by means of an aspirator caused a current of atmospheric air to pass through it for several hours. The cotton was then dissolved in a mixture of alcohol and ether, and the atmospheric dust deposited at the bottom of the fluid in a conical glass was examined with the microscope. The sediment thus collected contained grains of starch, and such other dust as is ordinarily found on surfaces exposed to the air. When submitted to the action of concentrated sulphuric acid the starch was soon dissolved, while other particles remained undissolved, and had all the characteristics of the spores of ordinary mucedines which are

* Comptes Rendus, 1860, T. L. LI.

known to resist the solvent properties of concentrated sulphuric acid. [It is worthy of notice that certain minute fungi are capable of decomposing a solution of sulphuric acid. A few years since a little mould, developed in the solution of sulphate of copper used for electrotyping in the department of the U. S. Coast Survey at Washington, proved an intolerable nuisance. It decomposed the salt, assimilating the sulphuric acid and rejecting the copper which was deposited around its threads in a metallic form. From this it appears that sulphuric acid does not prevent but may rather assist the growth of certain fungi.—*Tr.*]

To determine the action of atmospheric air, and of atmospheric dust upon fermentation, putrefaction and the appearance of organization, Pasteur adopted the following methods:

A flask was about half filled with a fluid consisting of water containing in solution about ten per cent of sugar, and from two to seven parts in a thousand of the scum of beer. The neck of the flask was drawn out in the flame of a lamp and attached to a platinum tube $\frac{1}{25}$ of an inch in diameter, which was then heated to redness. The fluid was boiled for two or three minutes to expel all air from the flask, when it was allowed to cool very gradually, and as it cooled, the air which entered the flask was calcined and all organic germs it contained were destroyed, by passing through the red-hot platinum tube. When the flask had thus cooled to the temperature of the surrounding air, the neck was hermetically sealed. The flask was then removed to an oven and kept at the temperature of 80° or 90° F. for an indefinite period, without producing any organisms or undergoing any change whatever.

To test the influence of atmospheric dust upon a fluid thus hermetically sealed, Plasteur placed a pledget of cotton or asbestos in a small tube, and caused a current of common air to pass through it by means of an aspirator. This small tube containing the cotton or asbestos loaded with atmospheric dust, was then transferred to a larger T-shaped tube, one end of which was connected by India rubber with the sealed flask, another end was connected wlth a platinum tube heated to redness, and the third being connected with an aspirator the apparatus was easily charged with calcined air and all the common air was expelled. The neck of the flask was then broken within the T-shaped tube, and the small tube containing the atmospheric dust was passed into the flask with access only of calcined air. The neck of the flask was then again hermetically sealed by means of the blow-pipe. Many flasks were prepared in this way, and in every case, after standing in a warm situation for twenty-four to thirty-six hours, vegetation appeared in the same manner as if the contents of the flask were exposed to the open air; but the moulds or mucedines appeared first in the little tube carrying the cotton, which was often thus filled to its extremities. The organic growths

which appeared, were the same as in flasks exposed to the open air, viz.: of infusoria, *bacterium*, of mucedines the *penicilium*, *ascophora*, *aspergillus* and some others. When calcined asbestos alone was introduced, no vegetation appeared.

It was thus demonstrated that among the dust suspended in ordinary air there are always *organized* corpuscles, and that these powders, when mixed with a suitable liquid in an atmosphere of itself inactive, give origin to *Bacteria* and *Mucedines* such as are furnished by the same liquid in the open air.

Pasteur confirmed these results by another method. Similar quantities of the same fermentable liquid were introduced into a series of flasks in all respects alike. The necks of the flasks were all drawn out over the flame of a lamp, and bent into a variety of different forms, but the tubular neck of each flask was left with an opening one twenty-fifth of an inch or more in diameter. In some of the flasks the liquid was boiled for several minutes, but three or four were not heated to the boiling point. All the flasks were then set away in a quiet place, free from currents of air. After twenty-four or forty-eight hours, according to the temperature, the flasks in which the liquid was not boiled after being put into them (although all the liquid had been boiled before it was put into the flasks), were found to be troubled, and covered little by little with mucor. The liquid which had been boiled in the flasks remained limpid not only for days, but even for entire months, although all the flasks were left open. There can be no doubt that the curves and sinuous forms of the necks, served to secure the contained fluid from the fall of germs.

The common air entered these flasks as they were cooling, but so slowly during the gradual cooling of the hot liquid, that the germs were either destroyed by the heat, or were deposited in the curvatures of the narrow necks of the flasks so that no viable germs reached the liquid. When the neck of one of these flasks was broken off, and the remaining portion placed vertical, in a day or two the liquid became mouldy or filled with bacteria. This method, which so well explains the preceding, and which can be readily practised by any one, carries conviction to unprejudiced minds. It gives also peculiar interest to the proof which it presents to us that *there is nothing in the air except its dust which is a condition of organization.* It thus appears that oxygen acts only to sustain life furnished by germs, while of gas, fluids, electricity, magnetism, ozone, things known or unknown, *there is nothing in the air except the germs which it carries which can originate organic life.*

Fermentation of Urine.—A flask with an attenuated neck was one-third filled with fresh urine and boiled for three or four minutes, and then allowed to cool with no access of air except what was drawn through a platinum tube heated to redness. When cool the flask was hermetically sealed, and the enclosed

urine was thus exposed only to atmospheric air deprived by heat of all viable germs. In this condition the urine remained for months without change. Into a flask thus prepared, asbestos charged with atmospheric dust was introduced by the method above described. The flask was kept at 86° F., and in about six hours mucedines and infusoria appeared, among which were *Bacteria*, *Vibriones* and *Monads*, the same as appeared in similar urine exposed to the open air. During the following days lithates and crystals of triple phosphate were deposited, the urine became ammoniacal, and its urea disappeared under the influence of the true ferment of the urine, which Pasteur believes to be organized, and whose germ could only have been introduced in the atmospheric dust in connection with the germs of infusoria and mucedines. When a flask prepared in the same manner had only calcined asbestos introduced, without atmospheric dust, neither mucedines nor infusoria appeared, neither did any fermentation take place, however long the flask was permitted to remain unopened.

Coagulation of Milk.—Fresh milk was boiled in a flask for two or three minutes only, and after being allowed to cool with access of calcined air, as in the preceding experiments, it was hermetically sealed. In eight or ten days the milk was coagulated, but when opened it was found remarkably different from milk coagulated in the open air, for it remained *alkaline as fresh milk;* but the milk was filled with infusoria, most frequently *vibrios* about $\frac{1}{500}$ of an inch in length, yet no vegetable productions were detected.

The common theory that milk coagulates in consequence of the formation of lactic acid is an error. It is also shown that vibrios may appear in milk which has undergone ebullition for several minutes at 212° F., although urine or a solution of sugar and albumen does not produce vibrios under such conditions. In other experiments the milk was boiled for longer periods under a pressure of 1½ atmospheres at a temperature of 230° or 235° F., and the flasks were sealed as before. Flasks thus prepared, furnished no infusoria; the milk did not coagulate, however long it remained enclosed in the flasks, it remained alkaline even with the presence of oxygen in the form of calcined air, as stated above, and it preserved apparently all the properties of fresh milk.

Into flasks of milk thus prepared, Pasteur introduced atmospheric dust by the method detailed above, when the milk coagulated, and both animal and vegetable productions appeared as in the milk exposed to the open air. The generally admitted theory of ferments, which had of late years received fresh support from the writings of chemists, now appears more and more at variance with the results of experiments. The ferment is not a dead substance without determinate specific properties. It is a being whose germ is derived from the air. It is not an albuminous substance altered by oxygen. The presence of albuminous matters is an indispensable condition of all fermentation, because the "*fer-*

ment" depends upon them for its life. They are indispensable in the light of an aliment to the ferment. The contact of the atmospheric air is, primarily, equally an indispensable condition of fermentation, but it is indispensable only as being a vehicle for the "*germs*" of the "*ferments.*"

There are many distinct organized ferments which excite chemical transformations, varying according to the nature and organization of the ferment.

To confute various objections made by advocates of spontaneous generation, Pasteur undertook to determine the relative abundance of organic germs in different localities. A series of flasks were all one third filled with the same putrescible fluid (a solution of sugar and albumen was employed in most of the experiments). The fluid was then boiled for two or three minutes in the flasks, and the neck of each flask was drawn out to a fine point and hermetically sealed while the fluid was hot. These flasks were then taken to different localities, and the points of the necks were broken and the air of the several localities allowed to rush in and fill the flasks. This violent ingress of air carried in of course all the dust held in suspension, and all other principles known or unknown associated with it. In this condition each flask was again hermetically sealed, and the whole placed where they were kept at a uniform temperature of 80° to 85° F., a temperature known to be the most favorable for the development of animalcules and mucors. The results of these experiments were not what the principles generally admitted would lead us to expect, but they were perfectly consistent with the theory of the diffusion of germs.

Generally in three or four days the liquid in the flasks was found altered, but in flasks placed in identical conditions were found very different organisms—much more varied, so far as mucedines and torulas were concerned, than if the liquids had been freely exposed to ordinary air. On the other hand, it frequently happened, in a series of experiments, that several of the flasks remained absolutely unaffected for an indefinite time, as if it had received only calcined air.

This simple and unobjectionable method of experimenting appears to demonstrate that the cause of so-called spontaneous generation does not exist in the ambient air throughout its whole extent, but that it is possible to take up in a single place and at a given instant a considerable volume of ordinary air which, without having undergone any physical or chemical change, is altogether unsuitable to give origin to infusoria or mucedines in a liquid which is invariably thus altered when it is exposed to the open air. The partial success of these experiments shows that by these movements of the atmosphere there is always brought to the surface of a putrescible liquid, in an open vessel, a quantity of air sufficient to furnish germs suitable to be developed in two or three days.

It appears that the organic productions in the flasks are more various than if the contact with the air had been free, i. e., the organisms in the several flasks are different. This result might have been expected, for by limiting the rush of air and repeating it with different flasks, a small number of germs would be collected in a limited portion of air and the growth of these germs would not be obstructed by other germs, more numerous or more vigorous or rapid in their growth, capable of monopolizing the soil to the exclusion of those less vigorous or less rapid in growth.

It was found that the number of negative results varied greatly with the atmospheric conditions, and that nothing was easier than to increase or diminish the relative proportion of flasks which gave birth to the organisms mentioned, or the number in which they were totally absent.

In the cellars of the observatory at Paris, so situated as to have very little change of temperature, and where the air was remarkably quiet, the proportionate number of flasks that were opened in that locality without producing any organisms was much greater than for the same number of flasks opened in the court-yard of the Observatory where the air was constantly agitated.

The explanation of this difference is obvious. Although the air of the cellars of the Observatory, nearly saturated with moisture, was more fitted for the production of the various kinds of mould and infusoria than the open air of the court-yard, yet the stillness of the air in the cellars allowed all the ova and spores to be deposited by the force of gravity, and few or none remained floating in the air which rushed into the flasks opened in that locality. In proportion as more precautions were taken to avoid agitating the air, there was less appearance of organization, and Pasteur concludes that if the flasks could be opened and closed in the cellars without the disturbance of the air caused by the entrance of the operator, there would be the same absence of vitality in the flasks filled with air from that locality as if they were filled with air exposed to a red heat.

The following results were obtained by Pasteur with flasks opened in widely different localities:

Sixty-three flasks were each one third filled with a clear liquid obtained by filtering water mingled with the scum of beer, all solid matter being removed by the process of filtering. This liquid is known to be very susceptible of change, for exposure to ordinary air for two or three days is sufficient to give birth to small infusoria or a variety of mucedines. The fluid was boiled in all the flasks, and they were hermetically sealed as in the previous experiments. Twenty of the flasks thus prepared were opened and closed in the country, far from any habitation, at the foot of those heights which form the first plateau of the Jura mountains.

Twenty other flasks were filled with air upon one of the moun-

tains of the Jura, 850 metres (2789 feet) above the level of the sea. Another series of twenty flasks were carried to Montanvert, near the Mer de Glace, to an elevation of 2000 metres (6562 feet), where they were filled with air and hermetically sealed like the others.

Of the twenty flasks opened in the level country, six developed organic productions. Among the twenty flasks opened upon the plateau of the Jura, only five developed organisms. But of the twenty flasks filled with air at Montanvert, when a strong wind was blowing from the gorges of the Glacier des Bois, one only produced organisms.

These experiments show that the air from elevated localities is remarkably free from those germs which give origin to animal products.

In collecting air for these experiments, the following precautions were adopted to avoid, as far as possible, the intervention of dust carried by the operator or deposited on the outside of the flask or other implements required in performing the experiments. The elongated neck of the flask was first heated in the flame of a lamp, and a scratch was made upon the glass with a file. The flask was then raised above the head, with the end of the neck turned towards the wind, and the point was broken off with long iron forceps, the branches of which had previously passed through flame to destroy any dust adhering to their surface, so that it might not remain to be driven into the flask by the sudden rush of air when the point of the flask was broken. Great pains were taken lest the agitation of the liquid in the flasks during transit might exert some influence unfavorable to the development of infusoria or mucedines.

The following results are therefore without objection, and they show the entire difference between the air of the plain or of elevations and that of inhabited places. Pasteur's first experiment at the Glacier des Bois was interrupted by a circumstance which had not been foreseen. He had taken to close the points of the flasks, after they were filled with air, an eolipile lamp fed with alcohol. The whiteness and glare of the ice, in the light of the sun, was so great that it was impossible to see the jet of alcohol flame, and as it was agitated by the wind it could not be directed upon the glass with sufficient steadiness to melt the point and hermetically seal the flask. As no means were at hand to render the flame visible, the flask could not be sealed, and there remained chances of error by the admixture of other powders. The three flasks which had been opened were therefore taken to the small village of Montanvert and sealed at his lodgings the next morning, after they had been exposed all night to the dust of the chambers where he slept. Of these three flasks only two produced either infusoria or mould. Since the number of flasks altered in this experiment is greater than that in those which fol-

lowed (the twenty flasks previously noticed), Pasteur concludes that the agitation of the liquid during the journey had no influence upon the development of germs.

It therefore appears to be satisfactorily demonstrated:—

1. That the air of inhabited places contains a greater relative number of fruitful germs than the air of uninhabited regions.

2. That the ordinary air contains only here and there, without any continuity, the condition of the first existence of generations sometimes considered spontaneous. Here, there are germs; there, there are none.

3. There are few or many, according to the localities. Rain diminishes the number, but after a succession of fine days they are more numerous. Where the atmosphere has been for a long time quiet, germs are wanting, and putrefaction does not take place as in ordinary circumstances.

Guy Lussac, Schwann and Pouchet have performed various experiments upon liquids in contact with common air, with heated air, with artificial air, and with oxygen gas, using a mercurial bath to isolate the substances experimented upon. Some of their results have appeared to favor the theory of spontaneous generation. Pasteur has ascertained that mercury taken from the bath in any laboratory is itself loaded with organic germs. He took a globule of mercury surrounded by an atmosphere of calcined air and passed it into a flask of putrescible fluid by the process detailed in the former part of this paper. In every experiment of this kind, after two days an abundant growth of organic products appeared.

The same experiments were repeated with the same liquids, with no change of manipulation, with the same kind of mercury, except that the mercury was first heated to destroy the germs it contained, and no growths whatever appeared in the flasks.

From all these experiments Pasteur concludes that: *Powders* suspended in the air are the exclusive origin, the first and necessary condition of life in infusions in putrescible bodies and in liquids capable of undergoing fermentation. It is easy to collect and observe with the microscope atmospheric dust, among which may always be found a great number of organized corpuscles, which the experienced naturalist will distinguish as the germs of inferior organisms.

[Some infusoria are not more than $\frac{1}{24000}$ of an inch in diameter, and if we suppose that the ova of infusoria and the spores of minute fungi are no more than one tenth part of the linear dimensions of the parent organism, there must be an incalculable amount of germs no larger than $\frac{1}{240000}$ or $\frac{1}{100000}$ of an inch in diameter. Since, according to Sullivant and Wormley (this Journal, vol. xxxi., p. 12), vision, with the most powerful microscope, is limited to objects of about $\frac{1}{80000}$ of an inch, we need not be surprised if infusoria and other organisms appear in putrescible liquids in far

greater numbers than the germs in atmospheric dust visible by the aid of the microscope would lead us to expect.—Tr.]

Pasteur proposes to continue these investigations, and expresses the hope that the way may thus be opened for a successful investigation of the origin of different diseases.

THE BOSTON MEDICAL AND SURGICAL JOURNAL.

BOSTON: THURSDAY, AUGUST 8, 1861.

We had something to say, a few weeks since, on the importance and necessity of the protection against quackery, not only of the profession, but of the people at large, over whose health they are the legitimately appointed overseers. We were led to our remarks by the action of the Louisiana Legislature with reference to this subject, and have since been glad to hear that the subject is attracting the attention of legislators in other portions of the country, and that other States may be induced to follow the noble example of Louisiana and Pennsylvania.

From the following communication, it seems that a need is beginning to be strongly felt in the West for the protection of the community against the horde of quacks of every name and degree which infest that region :—

Messrs. Editors,—I am rejoiced to see a general waking up of the medical profession of this country, to not only their own interests, but to the welfare and protection of the people. It certainly is a source of gratification to know that in some of the States legislative action has been taken upon the subject, and the medical profession is being placed in a position which has been denied it in former years. I refer to the Medical Registration Act already passed in the States of Louisiana and Pennsylvania. There is a pressing necessity of a similar law in this State, and could our Legislators be prevailed upon to pass such an act, they would confer a blessing rarely conferred upon a people. It is true, the West has become somewhat noted for the number of irregular practitioners it sustains, but I am happy to say that the number of that "*genus hominum*" is growing less as the people become more and more acquainted with medical subjects, and they find, gradually, less employment In the Registration act of Louisiana, and I believe also of Pennsylvania, there seems to be a defect which might be easily remedied. It is this. The act makes it obligatory upon the practitioner to make affidavit that he received a diploma from a regular incorporated medical institution, &c., but it does not require him to make affidavit that he received it in a legitimate and lawful manner. This, I think, he should be required to do, as he may have purchased a diploma from a medical institution, or obtained it in some other illegal manner; by such a clause being incorporated in the act, it debars all practitioners holding such diplomas from the protection and support of the law. There have been two instances in this county where practitioners have purchased diplomas from a certain medical institution in Ohio, both of which were granted to notably incompe-

tent persons; and if a registration law should be passed in this State, without the clause above spoken of, they too would enjoy its protection and benefits. There may be similar instances in other States, and we cannot be too alert in guarding against them, and any institution guilty of granting diplomas, except in a legitimate manner, should be frowned down, and looked upon as a hot-bed of quackery and charlatanism by all honorable practitioners throughout the land. Hoping that we too may soon rejoice in the passage of a sound registration law,

I am yours, &c., CHAS. H. LOTHROP.

Lyons, Clinton Co., Iowa, July 29th, 1861.

DEFICIENCY OF HOSPITAL SUPPLIES IN THE ARMY—VARIOLOID.—The following extracts are from an interesting letter by Surgeon E. K. Sanborn, of the 1st Vermont Regiment, dated Camp Butler, Newport's News, Va., July 20, 1861, and published in the New York *Medical Times* of August 3d:—

"Even now, after three months' time to provide for this increasing army, the Government supplies for hospital furniture are entirely insufficient. As an example which may serve as a general indication of the style of doing things at Fort Monroe, I will give the following cases happening under my own observation. The Vermont Regiment, as is well known, has been suffering from measles, and the usual pulmonary sequelæ; up to the present time, there have been 116 cases, in most cases owing to exposure in camp under the wonderfully variable temperature of the shores of James river. Severe bronchitis, simple and tuberculous, followed convalescence in a great proportion of the cases, and the demand for simple expectorant combinations was enormous—gallons per week. Now the supplies of squills, paregoric, tolu, have never been sufficient for one regiment. Last week, two ounces of syrup of squills was the entire quantity at the post, where twelve thousand men look for their supplies. No Peruvian bark, nor tinctures or other preparations of this standard remedy, except quinine. After great delay and repeated effort, a small quantity was purchased at Baltimore to meet my extraordinary case. Up to within one week there has been no ambulance or wagon of any shape to send into the field. At the battle of Bethel no conveyance of any description could be sent with the force from this point for the benefit of the wounded, though the force was a thousand strong."

The statement of a correspondent of the *Medical Times*, that no cases of varioloid had appeared at Fortress Monroe, is contradicted by the following extract from Dr. Sanborn's letter:—

"In this camp there have been five well-marked cases of varioloid, two perhaps being classed under the head of discreet smallpox. One of the cases (the last now convalescing) was a colored servant, who had care of the previous cases. The first case was early discovered in the N. Y. 7th Regiment (Germans), and isolated completely, and treated with secresy, so that even with the cases following, there was no general knowledge of the disease being present among the soldiers. Immediate measures were taken to vaccinate the troops, and lately, by order of Gen. Butler, they have been inspected carefully with regard to this point, by Dr. H. A. Martin, of Roxbury, Mass., an adept in the art."

SURGEONS IN THE LATE BATTLE AT BULL RUN.—In the battle of Bull Run the Medical Staff of the Army seems to have been severely exposed, and to have won deserved praise by its devotion to duty. The surgeons of the New York regiments especially suffered in their efforts to succor the wounded. In this connection we have to record the death of Dr. Alfred Powell, Surgeon of the Second New York Regiment. A captain of that regiment, writing to the *Evening Post*, says: "We mourn the loss of our physician, Dr. Alfred Powell, a noble man, who refused to leave those under his care, and was brutally murdered while placing our wounded in the ambulance." Dr. Powell was a highly respectable practitioner of this city, and relinquished a lucrative business to join his regiment.

His death, under the circumstances above given, attests his devotion to duty in the face of danger, and affords another illustrious example of medical heroism. Among the prisoners we notice the following surgeons from this city: Foster Swift, M.D., Stephen Griswold, M.D., Eugene Peugnet, M.D., S. Ferguson, M.D., Charles DeGraw, M.D.; and from Brooklyn, J. M. Homeston, M.D., and F. Swalm, M.D.; from Maine, B. Buckstone, M.D., A. Allen, M.D., A. A. G. Williams, M.D.

It is stated that the prisoners are engaged in attending the sick in the hospitals.—*American Medical Times.*

Gun-Shot Wounds.—This subject is interesting to the American surgeon. We simply enumerate a few striking facts.

A wound from a rifle ball is usually more depressed and discolored at the entrance than exit, the hole in the soft parts less in diameter than the ball; the contusion takes the form of several concentric circles, the parts involved sloughing out successively.

If the speed of a ball is great, it is very difficult to distinguish between entrance and exit.

Conical balls are seldom deflected; striking a bone, they pass through it, taking the shortest course; their wounds are more irregular, from the fact that they often receive their impulse in the direction of a diameter not parallel to the piece, and hence the side often strikes first instead of the end.

It is said that a 32-pound ball will pass through 70 men: an 8-pound ball, 40; a one ounce ball, 4.

It has been calculated that of all gun-shot wounds received in battle, there will be two in the abdomen; four in the neck or breast; seven in the head; ten in the arms; four in the hips or legs; one in the knee, and two in the feet. Nerves and bloodvessels, very fortunately, generally escape injury.

The sensation from a gun-shot wound resembles, it is said, a smart blow from a cane. Very many, however, of the worst of wounds are unattended with the least consciousness of injury. A soldier that had both legs shot away thought he had stepped into a hole.

In field-works the proportion of killed to wounded is greater than in the open field, from the circumstance of breast and head being more exposed in the former than in the latter position.

More men, or a larger portion of armies, were slain in battle in old times than at the present day, notwithstanding our improvements in fire-arms.

When the losses reach 33 per cent. the battle is ended. They are said seldom to reach this figure, never going beyond it.—*Ohio Med. and Surg. Journal.*

On Hematuria.—According to Oppolzer, it is often difficult to determine, in cases of hæmaturia, whether the blood comes from the bladder or the kidneys, as, even in the case of the recognition by the microscope of exudation casts presenting the form of the tubules of Bellini, it is not safe to decide absolutely on the existence of the form. Accordingly, we can only assume that an affection of the kidney is the cause of the hæmaturia when the tubecasts contain on their surface but a few blood globules. The rapidity with which the sediment takes place from the urine cannot be considered as characteristic of hæmorrhage from the bladder, as the duration of the intermixture of the urine with the blood is not known. In order to arrive at a satisfactory diagnosis, Oppolzer considers it essential to make a complete examination of the urine, which in kidney disease is characterized by a diminution of the urea, of the uric acid, and of the coloring matter (particularly of the urophæin of Heller), by an increase of the indigo, and almost invariably by the presence of albumen. On the other hand, if symptoms of a vesical affection are observed, there is a probability that there is disease of the bladder, especially if the urine, when emitted, is found to be decomposed. The causes of hæmorrhage from the bladder are numerous: stagnation of the urine, spasm of the bladder, paralysis, injuries of the bladder and of the adjoining organs by foreign bodies, urinary calculi, cancer; various medicines (such as cantharides), and certain constitutional conditions (as scurvy), may also give rise to hæmaturia. This condition may occur spontaneously, as amongst

the inhabitants of the Isles of France and Bourbon; or it may be occasioned, as in Egypt, by the hæmatobion, which also occasionally determines the formation of stone in the bladder. In all these cases the symptoms must decide what has been the special cause of the hæmaturia. Bleeding from the kidneys occurs in Bright's disease and nephritis; it accompanies renal calculi, cancer and tubercle of the kidneys; and is also observed in cases of disease of the heart, of compression and obturation of the renal veins, of scurvy, and of strongylus gigas. The treatment of hæmaturia consists in the treatment of the disease by which it is occasioned.—*Wien. Allg. Med. Zeitung.*

A NEW SALT OF IRON AND QUININE.—It is generally found that a salt of the protoxide of iron is preferable to one of a higher degree of oxygenation; but it is also difficult to obtain an absolutely permanent salt of the protoxide. Perhaps without exception, the sulphate is the most practically useful of all the salts of iron, owing to the uniformity of its composition. Of the quinine salts, the sulphate is also the most available for general purposes. It is not difficult to form a simple combination of these two sulphates, but the resulting compound is not well fitted for general use. The addition, however, of a certain proportion of sulphate of magnesia, enables us to obtain a salt which is nearly as soluble as the sulphate of magnesia itself—quite unalterable in the solid state, and forming a solution perfectly clear at first, and remaining so for an indefinite period. The iron has no tendency to a further state of oxygenation; the solution had been agitated with oxygen gas, and kept in contact with it for several days, without the least change. A solution of gallic acid tinges a solution of the salt of light bluish color after the lapse of two or three days, and many substances which produce an inky compound with the salts of iron may be mixed with it without causing any change of color.

The proportion of the three sulphates which has been adopted, is 80 per cent. of sulphate of magnesia, 15 per cent. of sulphate of iron, and 5 per cent. of sulphate of quinine, one scruple containing 16, 3, and 1 grains of the respective salts. These proportions have been found the best for general use, and also for the purpose of manufacture. The proportion of quinine may be increased by prescribing an additional quantity which is readily soluble in the solution of the salt.

One peculiarity is especially deserving of notice; that in this combination the assisting or adjuvant property of both iron and quinine are remarkably developed, the effect of both, particularly of quinine, being heightened in a very marked manner. At the same time, both the remedies are less apt to disagree with peculiar constitutions which ordinarily refuse to tolerate either iron or quinine. If the heightened power be borne in mind in prescribing this combination, there will be very few cases found in which it will not be suitable whenever either iron or quinine are indicated.—DR. FERGUS, in *London Pharm. Journal.*

LONG ISLAND COLLEGE HOSPITAL.—The second Annual Commencement of this Institution took place on the 16th ult., when the degree of M.D. was conferred on fourteen graduates. The Salutatory was delivered in Latin, by Dr. Mason, who also presented the diplomas. Dr. T. C. Ingersol, of the graduating class, delivered the valedictory.

MEDICAL CORPS OF THE NAVY.—Thirty-seven gentlemen recently passed a successful examination before the Naval Medical Board, convened in Brooklyn, N. Y. The Board is still in session, to fill up the number required by the recent act of Congress. Candidates should make written application to the Secretary of the Navy, stating age, birth-place and residence, with testimonials of moral character.

MUNIFICENT DONATION.—It was announced at the late meeting of the Alumni of Yale College, that the Scientific Department of that Institution had received, during the collegiate year, a second donation of $50,000 from Joseph E. Sheffield, Esq., of New Haven. The course of education in this Department is essentially that of the Polytechnic Schools of Europe, and is designed to fit young men for commercial and other practical pursuits, as well as for the direct applications of science.

THE ASILES IMPERIALES DE VINCENNES AND VESINET, IN FRANCE.—These are two large and new institutions unlike any other in the world. They are *maisons de convalescence*, or houses for convalescent patients—Vincennes for males, 420 beds; and Vesinet for females, 320 beds. They are about ten miles apart, occupying extensive richly improved grounds and presenting a palatial appearance, abounding not only with comforts but luxuries, such as were never known in institutions of charity before. They are both creations of the present Emperor. Vincennes was opened in 1856. Vesinet in '59; and are intended for the reception of convalescing patients from *all* the hospitals of Paris, which are so crowded, that a patient, if he recovers, cannot possibly fully recuperate there. They are sent out for twenty days to these two houses, where the delightful air in the country, the healthy diet, and other accessories, never fail to restore them to activity and usefulness.

Everything which science, common sense and experience could suggest to render these two institutions true convalescing places. has been done. Never have institutions shown better results than these, and they ought to be imitated in every country.—DR. S. POLLAK, in *St. Louis Med. Jour.*

NEW MEDICAL JOURNAL.—We have received the first number of a new monthly medical journal styled the *Buffalo Medical and Surgical Journal and Reporter*, and under the editorial supervision of Dr. Julius F. Miner, Surgeon to the Buffalo General Hospital. We cannot but admire the courage that attempts so bold an undertaking in the present crisis of affairs, and heartily wish our new friend the success which we are sure he deserves. The number contains 32 pages of reading matter, comprising several original communications of value.

MAJOR-GENERAL MCCLELLAN.—This distinguished officer is a son of the late Dr. George McClellan, of Philadelphia.

VITAL STATISTICS OF BOSTON.

FOR THE WEEK ENDING SATURDAY, August 3d, 1861.

DEATHS.

	Males.	*Females*	*Total.*
Deaths during the week,	52	56	108
Average Mortality of the corresponding weeks of the ten years, 1851–1861,	47.7	51.5	99.2
Average corrected to increased population,	..	..	110.6
Deaths of persons above 90,	..	..	..

Mortality from Prevailing Diseases.

Phthisis.	Chol. Inf.	Croup.	Scar. Fev.	Pneumonia.	Variola.	Dysentery.	Typ. Fev.	Diphtheria
12	32	0	5	3	0	1	2	0

METEOROLOGY.

From Observations taken at the Observatory of Harvard College.

Mean height of Barometer.	30.097	Highest point of Thermometer,	84.0
Highest point of Barometer,	30.118	Lowest point of Thermometer,	59.0
Lowest point of Barometer,	29.902	General direction of Wind,	West
Mean Temperature,	74.0	Am't of Rain (in inches)	1.99

BOOKS AND PAMPHLETS RECEIVED.—Transactions of the Medical Society of the State of New York.—Address on the Epizöoty, lately prevalent among Swine. By Edwin M. Snow, M.D., of Providence: with the Results of *Post-mortem* Examinations, by G. L. Collins, M.D., of Providence.

DIED,—In Roxbury, July 31st, Dr. Amos Farnsworth, 72.—In Lowell, 1st instant, Myron O. Allen, M.D., only son of Rev. Dr. Allen, 30.—In Cincinnati, William Judkins, M.D., in the 73d year of his age.

DEATHS IN BOSTON for the week ending Saturday noon, August 3d, 108. Males. 52—Females, 56.—Accident, 1—apoplexy, 1—inflammation of the brain, 3—cancer, 3—cholera infantum, 32—cholera morbus, 3—consumption, 12—convulsions, 3—diarrhœa, 1—dropsy, 1—dropsy of the brain, 7—drowned, 1—dysentery, 1—epilepsy, 1—scarlet fever, 5—typhoid fever, 2—hæmorrhage of the bowels, 1—disease of the heart, 2—infantile disease, 1—disease of the liver, 1—congestion of the lungs, 1—inflammation of the lungs, 3—marasmus, 7—necrosis (of the knee-joint), 1—old age, 1—premature birth, 2—unknown, 7—whooping cough, 4.

Under 5 years of age, 73—between 5 and 20 years, 9—between 20 and 40 years, 10—between 40 and 60 years, 7—above 60 years, 9. Born in the United States, 94—Ireland, 13—other places, 1.